TAO, Vol. 9, No. 4, 795-812, December 1998

Heat Flows off Southwest Taiwan: Measurements over Mud Diapirs and Estimated from Bottom Simulating Reflectors

Chuen-Tien Shyu[1], Shu-Kun Hsu[1], and Char-Shine Liu[1]

(Manuscript received 27 July 1998, in final form 30 November 1998)

ABSTRACT

The area offshore from southwest Taiwan is where the Taiwan mountain belt first encroaches on the Chinese continental margin. The northwestward convergence of the Luzon Arc towards the Chinese continental margin has resulted in stacking of thick sediments in terms of folds and thrusts off southwest Taiwan. Mud diapirs and bottom simulating reflectors (BSRs) are commonly observed in this region.

During the field experiment, the heat probe developed by the Institute of Oceanography, National Taiwan University is found to be efficient and durable. Using the newly designed heat probe, we have conducted fourteen in situ heat flow measurements off southwest Taiwan. The results show that : (1) Temperatures, temperature gradients, and thermal conductivities are anomalous and heat flows are higher above the area where mud diapirs appear. The mud diapirs are apparently influenced by relevant deep fluid migration through the pore spaces. The low heat flow found on the flank of a diapir probably results from the low thermal conductivity of mud breccia containing gas. (2) To apply the gas hydrate temperature-pressure phase diagram to derive temperature gradients from BSRs, if we speculate a gas composition of 90 percent methane and 10 percent ethane in pure water, a close estimation of the temperature gradient (only 6.3 percent less), compared with that measured in situ, is obtained.

(Key words: Heat probe, Heat flow, Mud diapir, BSR, Southwest Taiwan)

1. INTRODUCTION

The Eurasian and Philippine Sea plates are actively interacting in the Taiwan region. Northeast of Taiwan, the Philippine Sea plate subducts beneath the Ryukyu Arc and creates the Okinawa Trough backarc basin. South of Taiwan, the lithosphere of the South China Sea subducts eastward beneath the Philippine Sea plate along the Manila Trench and creates the Luzon Arc. The northwestward convergence of the Luzon Arc acts as a pushing agent to pile

[1]Institute of Oceanography, National Taiwan University, P.O. Box 23-13, Taipei, Taiwan, ROC